

ONTARIO AGRICULTURAL COLLEGE
EXPERIMENT STATION.

BULLETIN LXXXVII.

REMEDIES FOR COMMON PLANT AND
INSECT FOES.

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HISTORY AND GEOLOGY.

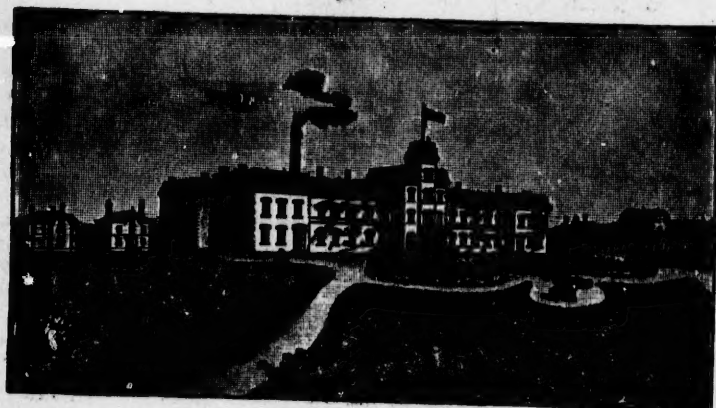
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BULLETIN LXXXVII.

REMEDIES FOR COMMON PLANT AND INSECT FOES.

So numerous have been the applications for Bulletin LXXXII, referring to some of the most common insecticides and fungicides, that it has been found necessary to prepare another bulletin upon the subject. Reference will now be made not only to the mixtures commonly used, but also to the way of applying them against specific forms of plant and insect enemies.

FUNGICIDES.

Fungicides may be defined as chemical compounds or mixtures used for the purpose of destroying such injurious forms of plant life as live upon other plants by absorbing their juices, whereby they affect their vitality. The *rusts*, *smuts*, *mildews* and *blights* are examples of such parasitic forms of plant life. Among the most common fungicides are the following:

Bordeaux Mixture. There are various forms of this mixture, the following being most commonly used:

(1) Consists of six lb. of copper sulphate, 4 lb. lime and 22 gals. of water. This may be prepared as follows: Dissolve the copper compound in sixteen gals. of water; slake the lime in 6 gals. of water, and when the latter is cooled pour it into the copper solution and mix thoroughly.

(2) A modified form is made by taking 4 lb. of copper sulphate, 4 lb. of lime and 50 gals. of water (Green's formula).

(3) Another form is made by taking 6 lb. of copper sulphate, 4 lb. of lime and 50 gals. of water (Weed's formula).

These diluted mixtures have been proved to be very successful, and are now commonly used. An advantage is gained by using Bordeaux mixtures, since Paris green may be added so as to combine insecticide and fungicide. So far experience indicates the Bordeaux mixture to be one of the best fungicides known.

Eau Celeste. Consists of 2 lb. of copper sulphate, 1 quart of ammonia and 50 gals. of water. Dissolve the copper sulphate in 3 gals. of hot water; as soon as cool add the 1 quart ammonia and dilute to 50 gals.

A modified form has been very successful, viz.: 2 lb. copper sulphate dissolved in 2 gals. of water, $2\frac{1}{2}$ lb. of sodium carbonate (washing soda) dissolved in another vessel. Mix these and when chemical action has ceased add 2 quarts of ammonia and dilute to 50 gals.

Copper Sulphate. 1 lb. copper sulphate in 25 gals. of water; spray early upon vines, etc., before leaves appear.

Ammoniacal Solution of Copper Carbonate. Dissolve 3 oz. of copper carbonate in 2 quarts of ammonia, and when about to use dilute it to 50 gals.

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Galloways Mixture No. 5. Equal parts ammoniated copper sulphate and ammonia carbonate, used at the rate of 8 to 12 ounces in 25 gals. of water.

Potassium Sulphide. Consists of 1 oz. potassium sulphide to 2 gals. of water.

INSECTICIDES.

These are compounds or mixtures used to destroy insects injurious to vegetation.

Paris Green. (Arsenite of copper, containing 50-60 per cent. of arsenic.) This is applied dry or in solution. In the dry form it should be mixed with 50 to 100 parts of plaster, wood ashes, flour or air-slacked lime, and dusted upon the affected plants. The form in solution is usually 1 lb. of Paris green to 200 gals. of water, but if the foliage is tender 250 to 300 gals. of water may be used. This is the usual strength applied upon the plum and peach. As the green powder does not dissolve it requires to be kept thoroughly mixed by constant stirring.

London Purple. This is an arsenite of lime obtained as a by-product in manufacturing dyes. It is largely used instead of Paris green; but being more soluble in water it is apt to injure the foliage, and, besides, its composition varies considerably so that when used it is not likely to give as uniform results as Paris green.

These arsenites are excellent against all leaf-eating insects.

Kerosene Emulsion. This is a mixture of coal oil and water. There are three formulas used to a considerable extent:

(1) *Riley-Hubbard Emulsion.* Consists of $\frac{1}{2}$ lb. of hard soap in 1 gal. of water. Boil till dissolved, and then add 2 gals. of coal oil, and mix thoroughly for about five minutes. When properly mixed it will adhere to glass without oiliness. This can be done by forcing it through the nozzle of a force-pump repeatedly until the mixture appears complete. It will then form a creamy mass which thickens into a jelly-like substance on cooling. In using, dilute with 9 parts of soft water.

(2) *Cook's Emulsion (soft soap).* Take 1 quart of soft soap and 2 quarts of boiling water, and while hot add 1 pint of coal oil; mix thoroughly as above. In using dilute with an equal amount of water, either hard or soft.

(3) *Cook's Emulsion (hard soap).* Take $\frac{1}{2}$ lb. of hard soap, 2 quarts of hot water and 1 pint of coal oil; thoroughly mix while hot. In using dilute with twice the amount of either hard or soft water.

Emulsions are successful against plant lice and scale insects.

Hellebore. This is the powdered root of a plant (*Veratrum album*). It may be applied dry, or in solution at the rate of 1 oz. to 3 gals. of water.

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Pyrethrum. Made from the powdered flowers of the genus *pyrethrum*, a plant of the sunflower family. It should be fresh, and hence ought to be kept in closed vessels. It may be used in dry form, 1 part pyrethrum to 5 or 8 parts of flour, or in liquid form in the proportion of 1 oz. in 3 gals. of water.

Carbolic Acid Emulsion. Consists of 1 part carbolic acid to 7 parts of a solution consisting of 1 quart of soft soap or 1 lb. of hard in 2 gals. of water.

Tobacco. The refuse from cigar factories is good, either dusted on in the form of a powder, or used as a solution in the proportion of 1 lb. in 2 gals. of water.

Whale Oil Soap. This may be used in the proportion of 2 oz. of the soap to 1 gal. of water.

Alkaline Wash. A strong solution of washing soda mixed with soft soap until about as thick as paint.

Carbolized Plaster. Consists of 1 pint of carbolic acid and 50 lb. of land plaster.

Combined Mixtures. By the combination of an insecticide with a fungicide we are able at the same time to cope with injurious insect and plant life. A good example of this can be seen in the application of a combined mixture to potatoes, in which case the beetle may be destroyed and the blight prevented. While combatting the "spot" of the apple the codling moth may also be fought if a combined mixture be used.

(1) 4 oz. of Paris green added to Bordeaux mixture (No. 2 or 3) makes an excellent combination.

(2) The following is also recommended: 2 oz. of Paris green and 2 oz. of copper carbonate dissolved in 3 pints ammonia, $\frac{1}{2}$ lb. of lime added to 32 gals. of water, and the whole thoroughly mixed. It is necessary to add the lime, or the foliage will be damaged.

PRECAUTIONS IN SPRAYING.

1. Keep poisons labelled, and out of the way of children.
2. Do not spray so far into the season as to affect the fruit.
3. In making emulsions remember the inflammable nature of coal oil.

4. *Never spray trees in bloom.*

5. Try solutions on a small scale if likely to injure foliage, and watch results.

6. Be careful and thorough in your work.

Careful analyses show that there is no ground for alarm regarding the effect of spraying fruit trees with Paris green.

The foregoing mixtures are usually applied by spraying machines, which can be procured through any responsible seedsman. As copper

compounds act upon tin and iron it is well to prepare such mixtures in earthen, wooden or brass vessels.

The Bordeaux mixture is rather dirty to work with, and inclined to clog the jet. Nevertheless it is about as effectual a fungicide as has yet been discovered. If used too long in the season it is apt to affect the appearance of the fruit. This can, however, be washed off with a dilute solution of vinegar.

Cost of the Mixtures. A fair idea of the cost of the various mixtures may be had upon an examination of the following price list of substances used in the different formulas:

Ammonia 25c. per lb.	Pyrethrum, 40c. per ..
Copper carbonate, 60c. per lb.	Copper sulphate, 12c. per lb.
Paris green, 30c. "	Hellebore, 25c. "
London purple, 15c. "	Sodium carbonate 5c. "

REMEDIES FOR CERTAIN INJURIOUS FUNGI.

1. *Apple Spot.* (1) Spray with Bordeaux mixture No. 2, making first application in spring before the blossoms open. Spray again as soon as the fruit is well formed. Now add 3 oz. of Paris green to the barrel and make three applications at intervals of two weeks. These last applications will destroy insects as well as the spores of the "spot" fungus.

(2) Copper carbonate ammoniacal solution referred to and Eau Celeste are also good remedies. With these the first application should be made previous to blossoming, the second when the fruit is about the size of peas, and the third two or three weeks later.

2. *Brown Rot* of plum, cherry and peach. Use the Bordeaux mixture in the same way as for apple "spot." Burn all affected fruit and leaves in the fall. If "rot" should set in make one or two sprayings with copper carbonate solution.

3. *Pear Leaf Blight*, which appears on both leaves and fruit, giving the leaves a spotted appearance and causing the fruit to crack.

(1) Spray with ammoniacal solution of copper carbonate as soon as the leaves begin to open, and repeat two or three times at intervals of two weeks.

(2) Use Bordeaux mixture as for apple "spot."

4. *Strawberry Leaf Blight.* Spray during July and August, every two weeks, with the following solution: 4 oz. of copper carbonate and two quarts of ammonia in a barrel of water.

5. *Gooseberry Mildew.* Spray with 1 oz. of potassium sulphide in two gallons of water. Begin as soon as the leaves are opening, and repeat about every three weeks.

6. *Grape Black Rot.* Spray with ammoniacal solution of copper carbonate of Bordeaux mixture (No. 2 or 3) six times, every two weeks, commencing early in May. If the last two sprayings are with the copper carbonate the fruit will not be disfigured.

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7. *Grape Down Mildew.* Spray with Eau Celeste about ten days before blossom; give another application as soon as the berries are set, and a third about three weeks later.

8. *Raspberry Cane Rust.* Spray with Bordeaux mixture (No. 2) before the leaves appear and two or three times after; but not after the blossoms open.

9. *Potato Blight.* Apply Bordeaux mixture (No. 2) three or four times, administering the first when the plants are about six inches high. If $\frac{1}{2}$ lb. of Paris green be added to the mixture beetles may also be destroyed at soon as they appear.

10. *Smut.* (1) Immersing seed in hot water of 135° Fahr. for five minutes will destroy the spores of smut. 5° above or below that point will fail.

(2) Put 1 lb. of copper sulphate in 20 gallons of water and allow the seed to remain in this for about 15 hours; then put the seed for 10 minutes in lime water made by slaking the lime in ten times its weight of water.

REMEDIES FOR SOME COMMON INJURIOUS INSECTS.

1. All *Leaf-eating* insects, such as canker worms, tent caterpillar, grape flea beetle, Tussock moth, fall web-worm, etc., are readily destroyed by spraying with Paris green, 1 lb. to 200 gallons of water.

2. *Borers* of the apple tree trunk and peach can be overcome by applying late in May or early in June to the trunks and large branches the following solution: 1 quart of soft soap or 1 lb. of hard soap in 2 gallons of water; heat to boiling point and add 1 pint of crude carbolic acid. It is well to scrape off the rough bark first, and then rub the mixture well on.

3. *Bark Lice.* Scrape off the bark during the winter and early spring, and rub on a solution made by adding one part of crude carbolic acid to 7 parts of a solution of soft soap 1 quart, or hard soap $\frac{1}{2}$ lb. in 2 quarts of boiling water. As soon as the young lice are hatched and begin to move (about June) spray the tree with a kerosene emulsion.

4. *Codling Moth*, or apple worm. As soon as the petals have fallen spray with a solution of 1 lb. of Paris green in 200 gallons of water; ten days later give a second application, and if necessary a third spraying may be given later on.

5. *Plum Curculio.* Spray with 3 oz. of Paris green to 50 gallons of water as soon as the blossoms have fallen, and give two more applications at intervals of about ten days. Jarring the trees and collecting the insects as they fall upon sheets is also much followed.

6. *Bud Moth*. This insect destroys the flower bud of plums, pears and apples. Spray with ordinary Paris green mixture when the buds begin to swell, and again in about ten days, that is, before the blossoms open. Kerosene emulsion is also recommended.

7. *Pear and Cherry Tree Slug*. Spray with either Paris green, hellebore or pyrethrum. Paris green in the proportion of 1 lb. to 250 gallons of water may be used for both broods if the trees are not bearing; otherwise use the Paris green for the second and either of the other remedies for the first brood.

8. *Potato Beetle*. Spray the vines with Paris green, using 6 oz. to 50 gallons of water.

9. *Squash Bug*. The young ones can be destroyed with kerosene emulsion; but those matured require to be hand-picked or caught under pieces of board placed among the plants where the bugs collect at night.

10. *Cucumber Beetle*. Cover the plants with netting so as to keep the beetles off.

11. *Plant Lice*. Use kerosene emulsion.

12. *Pea Weevil*. (1) Sow unaffected peas. (2) Heat affected peas as soon as gathered for 1 hour at a temperature of 145°. (3) Immerse affected seed peas in hot water, adding almost at once cold water, and leave for 24 hours.

13. *Strauberry Slug*. Spray the first brood with pyrethrum and the second with Paris green.

14. *Currant Worm*. Spray with hellebore 1 oz. to 3 gallons of water.

15. *Onion and Cabbage Maggots*. Use kerosene emulsion, and apply it in the vicinity of the plants. Carbolic emulsion has been very successful against the "radish maggot."

16. *Turnip Flea Beetle*. Dust upon the attacked plants while the dew is still on them 1 part of Paris green and 50 parts of land plaster. Tobacco dust is also effectual.

17. *Ground Outworms*, etc. (1) Surround the stem of the plant with heavy paper. (2) Sprinkle Paris green upon small bunches of fresh clover, and then scatter them about where the worms are working. They will serve as baits and poison many of the worms.

18. *Common Cabbage Worm*. Spray with a solution of 1 oz. of pyrethrum in 4 gallons of water. Kerosene emulsion may also be used on young plants.

In order to make this bulletin as concise and simple as possible many remedies have been omitted, and only the most successful noted. No description has been given, and only the common names of injurious plants and insects referred to have been used, as being sufficient for practical purposes. If further information is required it will be readily given on application to the writer.